WHAT IS CLAIMED IS:

1. A fuel cell comprising a housing including an anode chamber in communication with a fuel source via a conduit, a cathode chamber in fluid communication with an oxidizing agent, a proton conducting membrane electrolyte separating said chambers, and a heat-actuated valve proximate said conduit for automatically controlling a flow of fuel from the fuel source to the anode chamber.

2. The fuel cell according to claim 1, wherein a temperature of said conduit reflects an operational temperature of said fuel cell..

3. The fuel cell according to claim 1, wherein said heat-sensitive valve comprises a bi-metal material.

4. The fuel cell according to claim 1, wherein said valve comprises a shape-memory alloy.

5. The fuel cell according to claim 4, wherein said shape memory alloy comprises nickel-titanium.

6. The fuel cell according to claim 1, wherein said conduit includes a flexible tube connecting said fuel source with said anode chamber.

7. The fuel cell according to claim 1, wherein said fuel source is selected from the group consisting of: a fuel cartridge, a pump, and a mixing chamber.

8. The fuel cell according to claim 6, wherein said valve is positioned adjacent said flexible tube.

9. The fuel cell system according to claim 1, wherein said fuel cell is a direct oxidation fuel cell.

10. The fuel cell system according to claims 1, wherein said fuel comprises methanol.

11. A method for controlling flow in a fuel cell, comprising connecting said fuel cell to an electrical load, producing electrical energy, generating heat in response to the production of electricity by said fuel cell, automatically actuating a heat-sensitive valve for controlling said flow in response to said heat.

12. The method according to claim 11, wherein said valve comprises a shape memory alloy.

13. The method according to claim 12, wherein said bimetal material comprises a nickel-titanium alloy.

14. The method according to claim 11, wherein said flow is a fuel flow.

15. A fuel cell comprising a housing including an anode chamber having a fuel mixture, said anode chamber in communication with a fuel source, a cathode chamber in fluid communication with an oxidizing agent, a proton conducting membrane electrolyte separating said chambers, and a fuel concentration-actuated valve for automatically controlling a flow of fuel from said fuel source to said anode chamber.

16. The fuel cell system according to claim 15, wherein said fuel cell is a direct oxidation fuel cell.

17. The fuel cell system according to claims 15, wherein said fuel comprises methanol.

18. The fuel cell according to claim 15, wherein said fuel concentration-actuated valve comprises a first material which expands in direct relation to fuel concentration.

19. The fuel cell according to claim 15, wherein said fuel concentration-actuated valve comprises Nafion.

20. The fuel cell according to claim 18, wherein said first material is positioned within a flow channel providing fuel from said fuel source to said anode chamber.

21. A method for controlling flow in a fuel cell, comprising

connecting said fuel cell to an electrical load;

producing electrical energy;

providing fuel to a fuel mixture of said fuel cell in response to producing said electricity;

automatically expanding a first material in response to a fuel concentration of said fuel mixture, wherein expansion of said first material controls said flow.

22. The method according to claim 21, wherein said first material comprises Nafion.

23. A sensor for determining a concentration of fuel in a fuel mixture for a fuel cell comprising a conductor having a plurality of individual portions positioned proximate one another within a first material, wherein said first material automatically expands dependent upon exposure to a liquid medium.

24. The sensor according to claim 23, wherein said liquid medium is water.

25. The sensor according to claim 23, wherein said liquid medium is methanol.

26. The sensor according to claim 23, wherein said liquid medium is a methanol-water mixture.

27. A method for determining a concentration of fuel in a fuel cell comprising:

providing a first material capable of expanding in response to a concentration of fuel in a fuel cell, wherein within said first material a

conductor is positioned having a plurality of individual portions, and wherein upon a change in a concentration of fuel, contact between said plurality of individual portions correspondingly changes;

flowing an electrical current through said conductor;

measuring a resistance of said conductor, wherein as fuel concentration changes, the resistance of said conductor correspondingly changes..

28. A direct methanol fuel cell system comprising:

an anode chamber having a fuel mixture comprising methanol and water, and a diffusion layer;

a fuel supply cartridge in fluid communication with said anode chamber via a conduit;

a cathode chamber having a cathode and a diffusion layer, wherein said diffusion layer is in fluid communication with an oxidizer;

a proton conducting, electrical non-conducting membrane electrolyte separating said chambers and positioned substantially adjacent to said diffusion layers, said membrane including a catalyst exposed to each said chamber; and

a first valve for controlling a flow of fuel from said fuel supply cartridge, wherein said valve comprises a shape memory alloy.

29. A switch for a fuel cell, said fuel cell comprising a housing including an anode chamber in communication with a fuel source, a cathode chamber in fluid communication with an oxidizing agent, a proton conducting membrane electrolyte separating said chambers, said switch comprising a heat-actuated shape memory alloy

wherein below a predetermined temperature, said switch is in a first position, and upon said fuel cell reaching said predetermined temperature said switch is switched to a second position.

30. The switch according to claim 29, wherein said heat-actuated shape memory alloy comprises a NiTi alloy.

31. The switch according to claim 29, wherein said switch is disposed proximate to a portion of said fuel cell which reflects a current operational temperature of said fuel cell.

32. The switch according to claim 29, wherein a positioning of said switch between said first position and said second position is variable depending upon an operating temperature of said fuel cell.

33. A switch for a fuel cell, said fuel cell comprising a housing including an anode chamber in communication with a fuel source, a cathode chamber in fluid communication with an oxidizing agent, a proton conducting membrane electrolyte separating said chambers, said switch comprising a first material having expansion properties upon exposure to water, wherein said switch is in a first position prior to exposure to water and said switch is in a second position after said first material is exposed to water.

34. The switch according to claim 39, wherein a positioning of said switch between said first position and said second position is variable in a non-linear aspect in relation to an amount of water said first material is exposed to.

35. The switch according to claim 39, wherein said switch is placed in a third position upon exposure of said first material to a concentration of methanol.

36. The switch according to claim 35, wherein an actual position of said third position is directly dependent upon said concentration of methanol.